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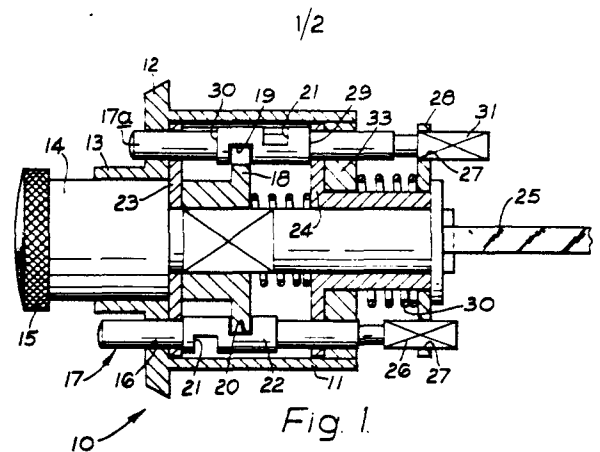
Applicant: **COMBI-LOCK ENTERPRISES LIMITED,**  
Heaton Mill, Harrowby Street,  
Farnworth, Bolton BL4 7BW Lancashire (GB)

Inventor: **Hatch, George,**  
23 Grimshaw Avenue,  
Failsworth, Manchester M35 9JT (GB)

Representative: **Daunton, Derek,**  
Barlow, Gillet & Percival, 94, Market Street,  
Manchester M1 1PJ (GB).

**Combination lock**

A combination lock, particularly a domestic door lock, comprises a rotatable and axially movable plunger (14), a plurality of axially displaceable pins (17, 17a) disposed around the plunger (14), a rotary ward disc carried by the plunger slots (19, 20, 21) in the pins (17, 17a) to allow rotary movement of the plunger (14) only when selected ones of the pins (17a) are axially displaced relative to the remainder of the pins (17), to have slots (19) therein aligned with the ward disc (18), and a member (23, 24) carried by the plunger (14) and capable of moving the pins (17, 17a) to an aligned position upon axial movement of the plunger (14). A user can move said selected pins (17a) to render the plunger (14) turnable to open the door and then easily pull or push the plunger to cause said member (23, 24) to re-align the pins (17, 17a) to prevent the selected pins (17a) remaining depressed and the "combination" visible.



**EP 0 000 003 A1**

Application for Patent Under the European Patent Convention

Applicants: COMBI-LOCK ENTERPRISES LIMITED

Inventor: GEORGE HATCH

DESCRIPTION

This invention relates to a combination lock, for example for use as a front door lock, or for any other purpose wherein a rotary unlocking and locking motion is desired.

Accordingly the invention provides a combination lock comprising a rotatable and axially movable plunger, a plurality of axially displaceable pins around the plunger, a rotary ward disc carried by the plunger and cooperating with said pins to allow rotary movement of the plunger only when selected ones of the pins are axially displaced relative to the remainder, and a member carried by the plunger and capable of moving the pins to an aligned position upon axial movement of the plunger.

Preferably the lock comprises a cylindrical barrel closed at one end by a front plate, centrally of which a spigot surrounds the outer end of a plunger terminating

in a handle and around the spigot a number of equally spaced bore holes allow the heads of the same number of pins to project therefrom.

A ward disc may be carried by the plunger inside the housing and selected ones of the pins may have slots which are aligned with the ward disc when they are displaced.

Each pin may also have a slot in its outer side in the corresponding position.

Advantageously each pin has a central enlarged portion in which both said slots are formed. An outer setting plate carried by the plunger may engage the outer shoulders and an inner resetting plate may engage the inner shoulders.

The end of each pin remote from its head can be prevented from rotation by engagement with a resetting member, this member preferably being movable to allow each pin to be rotated through  $180^{\circ}$  so as to enable it to be chosen to be one of said selected ones or not as desired. By using the resetting member the user can effectively select his own combination.

The invention will be described further, by way of example, with reference to the accompanying drawings which illustrate a preferred embodiment, it being understood that the following description is illustrative and not limitative of the scope of the invention.

In the drawings:

Fig. 1 is a cross-sectional elevation of a first preferred embodiment of lock of the present invention;

Fig. 2 is an end elevation of the lock of Fig. 1; and

Fig. 3 is an exploded view showing a second embodiment of lock, similar to the lock of Fig. 1, but with a modification

A first preferred embodiment of lock 10 of the invention comprises a cylindrical barrel 11 closed at one end by a front plate 12. Centrally of the front plate 12 a spigot 13 surrounds the outer end of a plunger 14 terminating in a handle 15, and around the spigot 13 ten or any other number of equally spaced bores 16 allow the heads of the same number of pins 17 to project therefrom. The pins 17 are axially slidable. A ward disc 18 is carried by the plunger 14 inside the housing and selected ones of the pins 17, for example the upper pin 17a in Fig. 1, have slots 19 which are aligned with the ward disc 18 when they are displaced inwardly towards the inner end of the barrel 11. The remainder have slots 20 which are aligned with the ward disc 18 when they are not so displaced. Each of the pins 17 also has a slot 21 in its outer side in the corresponding position.

Each pin 17 has a central enlarged portion 22 in which both said slots 19/20 and 21 are formed and inner and outer shoulders 29, 30 are at each end of the central enlarged portion 22. An outer scrambling plate 23 carried by the plunger 14 can engage the outer shoulders 30 and an inner scrambling plate 24 can engage the inner shoulders 29.

The pins 17 will normally all lie in their inner positions with their outer ends close to the surface of the front plate 12. To open the lock 10 under these circumstances the user pulls the plunger 14 outwardly to cause the inner setting plate 24 to push all the pins 17 to protrude from the front plate 12. He then pushes said selected pins 17a (known only to himself) inwards, enabling the ward disc 18 to rotate and thus the plunger 14. A non-circular protrusion 25 on the inner end of the plunger can operate a sliding bolt or the like.

After rotation of the plunger 14 and opening of say, a door, the selected pins 17a are still depressed, thus showing the combination. Thus after opening the door the user must depress or pull the plunger 14 to align all the pins 17 by the operation of one or other of scrambling plates 23 and 24 on the central portions 22 of the pins 17, 17a. so as to conceal or "scramble" the combination.

The user can change the combination very simply. Each pin 17 is rotatably mounted by the barrel assembly 11 and its inner end has a non-circular portion 26 slidable relative to a slot 27 in a slotted circular resetting member in the form of a plate 28. By pressing this plate 28, to the left in Fig. 1 against the action of a spring 30, the user is enabled to rotate the pins 17 to bring one or other of said slots 27 into its radially inner operative position. The plate 28 can now be returned to the normal locking position. When the combination lock is used in combination with a conventional "Yale" or like slidable bolt on the inside of the door the lock can be made to act as a deadlock or a conventional spring lock by selecting the rotational position of the plunger 14 at which the pins 17 are reset.

The invention is not limited to use in connection with domestic doors, but can be used in any situation where a lockable rotary element is desired. Indicia 31 may be provided on the inner end of the pins 17 to identify the position of the slots 27 when setting the combination. Detent means are provided for retaining the pins in their various axial positions. Indicia 32 may also be provided on the front of the casing in order to identify individual pins.

To secure the lock 10 to a door a front plate 12 can have threaded apertures (not shown) which can receive the ends of set-screws passing through the door from the inside. Alternatively, studs can extend from the plate 12 and be engaged by nuts on the inside of the door.

Fig. 3 illustrates a variation of the lock 10. Plate 24 is a simple annulus and the rear of the lock comprises a closing plate 33 to which a plug 34 is securable by screws 35. An annular groove 41 in plug 34 accommodates a resilient ring 36 against which bears one of two concave surfaces 37 formed in a rear part of each of pins 17. A second resilient ring 38 surrounds the rear parts of pins 17. To re-set the lock of Fig. 3, the screws 35 are removed and plug 34 detached. The desired pins 17 can now be rotated to be part of or out of the group of selected pins 17a. The plug 34 is now replaced. A bolt operating tongue 39 is pivotally attached to the inner-end of plunger 14 by a split peg 40.

Application for Patent Under the European Patent Convention

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CLAIMS

1. A combination lock comprising a rotatable and axially movable plunger (14), a plurality of axially displaceable pins (17, 17a) around the plunger (14), a rotary ward disc (18) carried by the plunger (14) and co-operating with said pins (17, 17a) to allow rotary movement of the plunger (14) only when selected ones of the pins (17a) are axially displaced relative to the remainder of the pins (17), and a member (23 or 24) carried by the plunger (14) and capable of moving the pins (17, 17a) to an aligned position upon axial movement of the plunger (14).

2. A lock as claimed in claim 1 characterised in that it comprises a cylindrical barrel (11) closed at one end by a front plate (12), centrally of which a spigot (13) surrounds the outer end of the plunger (14) which terminates in a handle (15).



3. A lock as claimed in claim 2 wherein a number of equally spaced bore holes (16) in the front plate (12) around the spigot (13) allow the heads of the same number of pins (17, 17a) to project therefrom.

4. A lock as claimed in claim 2 in which the ward disc (18) is carried by the plunger (14) inside the barrel (11) and selected ones of the pins (17a), have slots (19) which align with the ward disc (18) when those selected pins (17a) are displaced relative to the other pins (17).

5. A lock as claimed in claim 4, wherein each pin (17, 17a) also has a slot (21) in its outer side in a corresponding position to the aligned slots (19, 20).

6. A lock as claimed in claim 5 in which each pin has a centrally enlarged portion (22), with inner and outer shoulders (29, 30) at respective ends, in which central enlarged portion said slots (19, 20, 21) are formed.

7. A lock as claimed in claim 6 in which a first said member (23, 24) is in the form of a scrambling plate (23) carried by the plunger (14) and can engage the outer shoulder (30) of the centrally enlarged portions (22) of pins (17, 17a) and a second said member (23, 24) is in the form of a scrambling plate (24) which can engage the inner shoulders (30) of the said enlarged portions (22) of the pin (17, 17a).

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8. A lock as claimed in claim 7 and wherein each pin (17, 17a) has a rear portion (26) thereof shaped to engage a re-setting member (28) relative to which it is normally axially slidable but not rotatable.
9. A lock as claimed in claim 8, wherein the re-setting member is displaceable to allow each pin (17, 17a) to be rotated through  $180^{\circ}$  to enable it to be included in or excluded from said selected plurality at the will of the user.
10. A lock as claimed in claim 9, wherein each pin (17, 17a) has a rectangular rear end portion (26) engaged in a slot (27) in a re-setting member in the form of a plate (28), the plate (28) being displaceable against the action of a spring (30) to disengage said rectangular end portions (26) for re-setting.
11. A lock as claimed in claim 9, wherein the re-setting member is in the form of a plug (34) having a cylindrical outer surface and detachably secured to the barrel (11) of the lock, each pin (17, 17a) having two complementarily curved convex surfaces (37) at its rear end spaced  $180^{\circ}$  apart, enabling one or the other to be disposed adjacent the plug (34).
12. A lock as claimed in claim 11, wherein a resilient ring (36) is located in an annular groove (41) in the plug (34).
13. A lock as claimed in claim 12, wherein a second resilient ring (38) surrounds the rear end portions (26) of the pins (17, 17a).

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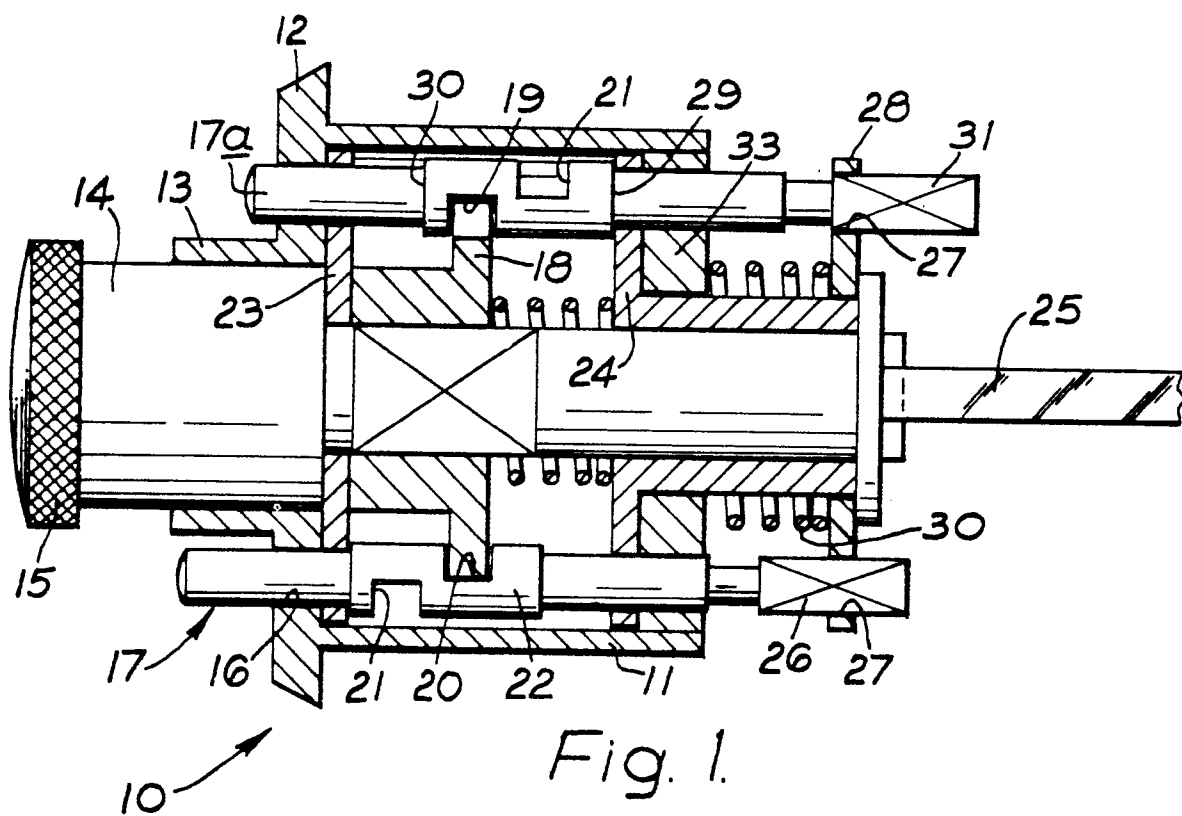


Fig. 1.

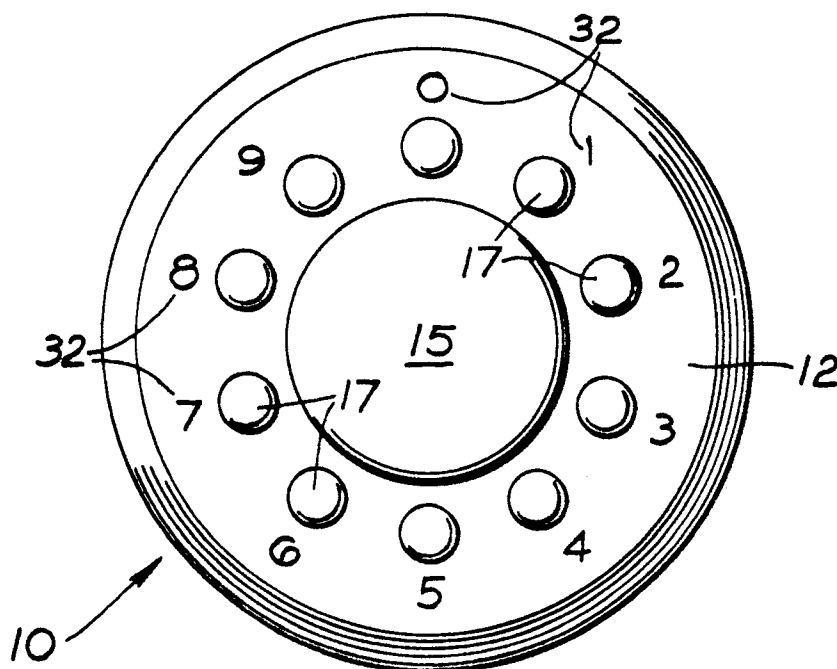


Fig. 2.

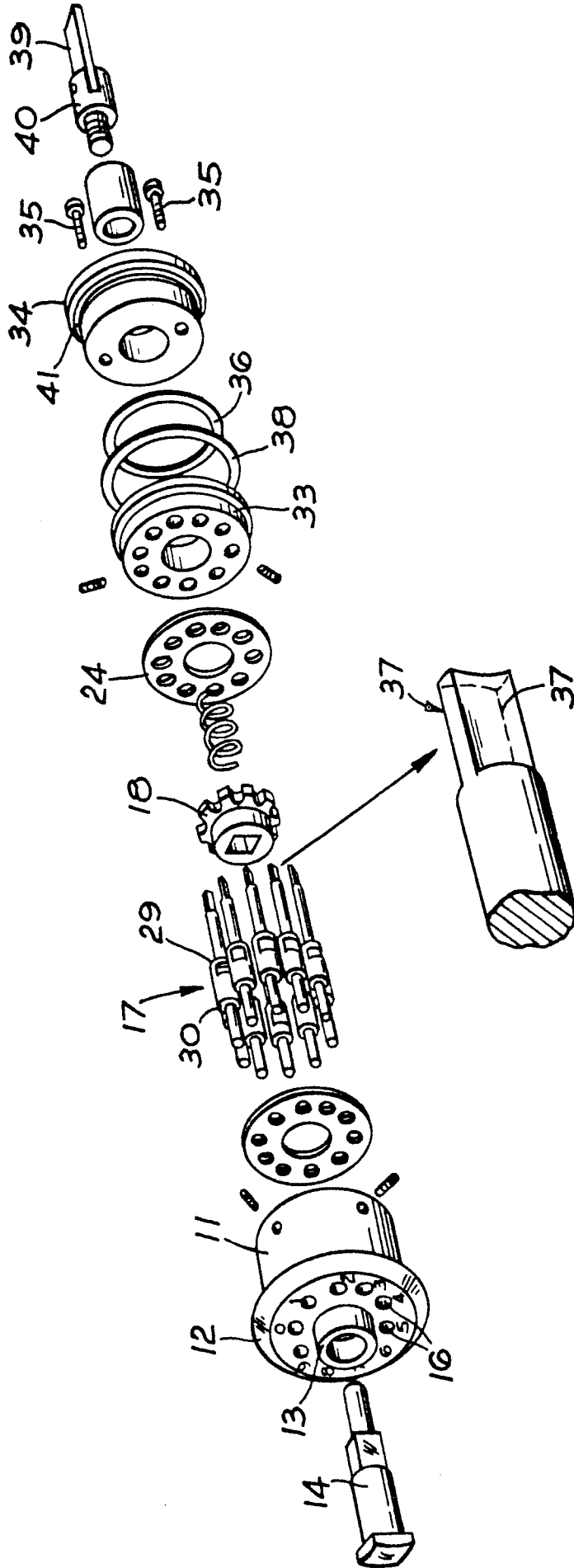


Fig. 3.



DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl. <sup>2</sup> )
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
X	<p><u>GB - A - 209 638</u> (H. SNOWDON STANDEN)</p> <p>* Complete document *</p> <p>-----</p>	1-8	E 05 B 37/16
			TECHNICAL FIELDS SEARCHED (Int. Cl. <sup>2</sup> )
			<p>E 05 B 37/16</p> <p>E 05 B 37/18</p>
			CATEGORY OF CITED DOCUMENTS
			<p>X: particularly relevant</p> <p>A: technological background</p> <p>O: non-written disclosure</p> <p>P: intermediate document</p> <p>T: theory or principle underlying the invention</p> <p>E: conflicting application</p> <p>D: document cited in the application</p> <p>L: citation for other reasons</p>
			&: member of the same patent family, corresponding document
<p>V The present search report has been drawn up for all claims</p>			
Place of search	Date of completion of the search	Examiner	
The Hague	17-08-1978	VAN BOGAERT	